to their possessors, or not more useful to them than many other existing structures would have been. . . . Less attention has been directed to the non-adaptive characters, yet they are as numerous as the adaptive. I do not include under this head useless organs or parts only, but also those which are useful, but whose peculiarities do not relate to that use as advantageous to it."

By the last qualification is meant that even useful organs often present peculiarities, which may run through whole orders and classes, and which nevertheless present no utilitarian significance. In the opinion of the present reviewer, the above estimate of the proportion of non-adaptive to adaptive structures is excessive, and some of the instances which are given of the former may be open to question. But even if a Darwinist is not prepared to allow that so many as "one-half of all the peculiarities of the parts of animals (and probably of plants) are of no use to their possessors," he may feel that the mere possibility of such a first-hand observer as Prof. Cope making such a statement is enough to discredit the non-Darwinian assumption of utility as *universal*.

GEORGE J. ROMANES.

THE TEACHING OF GEOGRAPHY.

The Teaching of Geography. By Archibald Geikie, LL.D., F.R.S. (London: Macmillan and Co., 1887.)

EIGHTEEN years ago the Royal Geographical Society instituted its public school medals. That was the beginning of its efforts in the cause of geographical education. We believe that it is to Mr. Francis Galton that the honour of having started this policy is due. For many years he, Mr. Clements Markham, and a few others persisted in the face of cold indifference and with little success. At last, in 1884, it was determined to make a fresh and energetic start. Mr. Keltie was appointed Inspector of Geographical Education, and from the date of the publication of his report progress has been very rapid. It was seen at once that one result of that report would be a large crop of geographical text-books. Of those which have already appeared that of Mr. Chisholm is certainly the best; and although it bears sadly too many of the marks of haste, it is a decided advance on all previous work of the kind in the English language. In Dr. Geikie's little book we have before us the first instalment of a still more ambitious scheme. Fourteen more volumes are contemplated to complete the series to which this is an introduction.

It is needless to say that when it was first rumoured in geographical circles that the author of "The Scenery of Scotland" was engaged on a book on the teaching of geography much was expected. After reading the work carefully through we cannot say that we are disappointed. Except in matters of detail, the only criticism we feel inclined to pass has reference to the title. The author has scarcely been just either to his book or to geography in using the present title. We have before us in fact an admirable essay on certain methods of teaching, but applicable to many subjects, and illustrated by many subjects which even the most grasping geographer would scarcely claim as his. It is surely an abuse of terms to say that we are teaching geography when we are giving lessons on the "house-fly, grasshopper, dragon-fly, wasp, beetle, and butterfly—showing the similarity and diversity of plan in the great class of insects" (pp. 103-4), or learning that "the breast fins in fishes, the wings in birds, the fore-limbs in quadrupeds, and the arms in man are all modifications of the same parts of the vertebrate skeleton." Again, on p. 106, the teacher is advised to insinuate the laws of health into his geographical teaching, and to explain the physiology on which they are based; and on p. 119 to tell of exchange by barter, and of the value of a medium of exchange. There are many similar instances, but we are reluctant to press this kind of criticism too far, for in this book Dr. Geikie renders great services to the causes both of education and of geography.

There are, in truth, at the present time, several great ideas in the air, destined probably to revolutionize education, but as yet hardly differentiated from one another. It is beginning to be generally recognized that geography, so far from being an elementary subject, is one which requires as a basis a great and most varied fund of information. But there is a tendency to throw geography into confusion by including all this within the subject itself. The essence of geography is topography, and its method is the comparative method of Carl Ritter. Its function is to compare localities, to ascertain their relations in space, and to assign causes for those relations and for the similarities and differences of the localities compared—and all this, as Dr. Geikie says, with especial reference to the earth as a dwelling-place for man. But before we can with advantage compare localities, we must know scientifically and by personal experience at least one. To acquire such knowledge is to learn to observe and to reason independently, to learn the use of our eyes and hands, to learn many of the great laws of science and the scientific explanations of a multitude of everyday experiences. In the greater portion of his book Dr. Geikie is occupied in asserting and demonstrating the possibility of laying this foundation in general science outside the laboratory, and by a skilful use merely of the experience of common life, and he does so with signal success. If teachers will study this method, and if examining authorities will cease to thwart their efforts, there may be some chance of removing the book-bias from our teaching, and of making the decisions of our examiners more nearly resemble those of the great world in after life. It is natural that at first these efforts should be made in the name of geography. But a cleavage is already discernible in the geographical confusion. On the one hand, is a science investigating a definite set of relations, but linked in all directions with other subjects, and in that similar to other composite sciences, like geology and anthropology; and, on the other hand, an educational method for the teaching of the rudiments of scientific thought and facts, an excellent foundation equally for scientific specialism and for practical life.

In matters of detail we have found many valuable hints in the last few chapters, which deal with subjects more strictly geographical. The list of books of reference at p. 46, however, hardly rises to our ideal. The list is, of course, intended for general teachers, and not for geographical experts. Bearing the practical requirements of this class in view, we should have preferred fewer books of early, and more of recent, date. The lack of modern

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authorities on European lands is especially noticeable. We are aware that this is intentional on the part of the author, but we hardly think that he has been well advised. It is among the multitude of modern books of travel, for the most part indifferent or bad, that guidance would be most valuable.

H. J. MACKINDER.

OUR BOOK SHELF.

Chemistry and Heat. By R. G. Durrant, M.A., F.C.S. (London: Rivingtons, 1887.)

THIS little book is a collection of laws and definitions connected with chemistry and heat, intended more especially for the use of students preparing for examination in these subjects. It is to be regarded chiefly as a companion to more extensive treatises, and as a substitute for the extracts and notes which the average student would make for himself.

The various laws are stated very clearly, and the examples illustrating them have been happily chosen. The subject of heat is only considered in so far as it enters into chemical work. The laws relating to atomic weights are particularly well arranged, and zinc being taken as a typical element, a whole chapter is devoted to the method of estimating its atomic weight. A chapter is also devoted to the determination of vapour densities by the well-known methods of Dumas, Hofmann, and Victor Meyer, each being illustrated by a numerical example. In all cases the details of the calculations are gone through with great care.

At the end of the book is a table showing the characteristic tests for the more important metals and acids. This is not nearly up to the same standard as the earlier part of the book, but still it will be of service where expedition is of maximum importance. We are afraid, however, that the results obtained by analyses without separations would not always be perfectly trustworthy. We should have expected the author to be aware that separations are indispensable for most examinations in practical chemistry. Several specimens of analyses are given in detail.

We have no doubt that the book will prove a useful addition to the already large family of hand-books prepared for the use of the fortunate student of chemistry.

A. F.

On Overwork and Premature Mental Decay. By C. H. F. Routh, M.D., M.R.C.P. Fourth Edition. (London: Baillière, Tindall, and Cox.)

DR. ROUTH takes a very gloomy view of some of the characteristics of the present age. He holds that insanity and premature mental decay are decidedly on the increase, and this fact he attributes chiefly to overwork. Whether or not he is correct in his interpretation of the statistics relating to insanity, there can be no doubt that overwork is far too common in these days of excessive competition, and Dr. Routh has done good service by showing clearly in this little book the inevitable consequences of any severe and continuous strain upon the powers either of the mind or the body. As to remedies for the evil consequences of overwork, he offers many wise suggestions, and prudent readers will probably be all the more inclined to pay attention to his counsels when they find that he lays stress mainly upon the necessity for periods of rest, for the cultivation of a variety of intellectual interests, and for rigid self-control. Dr. Routh has added to the value of his work by discussing in the present edition the effects of overwork upon women and young persons.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

Hall and Knight's "Higher Algebra."

IN your issue of September 1 (p. 409), there appeared a review of our "Higher Algebra," bearing the signature "R. B. H." The work under consideration is a sequel to an elementary text-book, as the title-page asserts; it does not profess to be anything more, and we should have thought that any reader would have recognized that "Higher" and "Elementary" are merely used as relative terms. This point has been practically ignored by your reviewer, and in consequence his remarks contain certain inaccuracies and misconceptions likely to leave a false impression on the mind of the reader.

In the first place, "R. B. H." complains that we postpone to our thirty fourth chapter the discussion of the fundamental laws of algebra, the "remainder theorem," symmetrical expressions, and identities. As a matter of fact, these things do not appear here "for the first time;" propositions scattered over the "Elementary Algebra" are here summarized, and in some cases rediscussed; and, with regard to the "remainder theorem," its proof and easy applications are to be found in the twenty-ninth chapter of the elementary work—a chapter which also contains a section on identities and transformations, especially those which can be treated cyclically. Hence, in criticising the miscellaneous chapter of the more advanced work, it should be remembered that for the most part it merely extends and develops what has elsewhere already been treated far more comprehensively than is usual in an Elementary Algebra.

In the chapter on "Miscellaneous Equations," we are told that "there is no hint or caution given that the root obtained may not satisfy the original equation unless the sign of one or more of the radicals involved in it is changed," and our attention is called to an example on p. 99. Surely "R. B. H." must have read this page somewhat carelessly, for at the head of it there stands a remark containing the required hint, while reference is made to a note in the "Elementary Algebra," in which the point is fully discussed.

The remarks on our chapter on permutations and combinations are somewhat vague and indefinite, and we do not gather which proofs are held to be "very difficult to understand." We have used the methods of this chapter very successfully with boys of ordinary intelligence for twelve years or more, and we have always found the proofs contained in Arts. 141, 152, 153, and 156 far more intelligible than those given in other text-books. The illustration given by "R. B. H." may be useful enough for blackboard work, and it is hardly conceivable that any teacher of experience would attempt to handle this part of algebra without a frequent and ready use of such exemplification; but we fail to see how a *proof* of the general formula for the number of permutations of n things r together could be framed on these lines in a form suitable for a text-book.

To the other points raised by your reviewer we do not reply because they are mostly matters of opinion, and whether we have been judicious in our arrangement and subdivision of the subject is a question which can only be decided by the experience of teachers using our books. But we may perhaps remark that the obvious necessities of a school text-book should not be overlooked. In its present form our "Elementary Algebra" contains upwards of 360 pages, and if we had included all the sections now suggested by "R. B. H." the book would have been increased by 150 pages or more, and would have been practically useless, for it would have been published at a price quite prohibitive for school use.

Our two books have been designed to form one complete treatise, and we venture to think that anyone who will fairly criticise the work as a whole will not find the glaring omissions and "defect of plan" suggested by your reviewer.

H. S. HALL.
S. R. KNIGHT.

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